park, and have set apart for the purpose a tract of sixty acres, to which additions will be made from time to time as occasion may require. A botanical museum and herbarium will be included in the scheme. A circular has been issued by the board of managers, soliciting contributions from kindred institutions. The works are to be commenced as soon as the weather will permit.

IT may be remembered that the United States steamer *Tuscarora*, after having completed the line of soundings made for the purpose of selecting a suitable route for a Transpacific cable, under Commander Belknap, again started on the same duty, under the charge of Capt. Erben, leaving San Francisco on the 1st of November direct for the Sandwich Islands. The *Hawaiian Gazette* of Dec. 2 announces her arrival at Honolulu, and remarks that, in all, sixty-two casts of the sounding-line were made, the first near the Farallones, the water gradually deepening from that point to 2,500 fathoms. In lat. 33° 10′ and long. 132° the depth began rapidly to diminish, showing 1,417, 435, 413, and, finally, 385 fathoms in lat. 32° 58′. Numerous observations were made, which showed that there was a submarine peak rising about 2,200 fathoms from the ocean bed. Beyond this, for a circuit of five miles around this peak, deep water was found in every direction, and a few miles from the peak 2,500 fathoms were reached. From this the depth gradually increased, until in lat. 24° long. 152° the depth was 3,115 fathoms. This was only about 400 miles from Honolulu. The soundings brought up from the peak showed a mixture of lava and coral, which is supposed to be indicative of a submarine volcano. The temperature at the bottom was found to vary but little from 35° to 36° F. The results of the survey, according to the *Gazette*, are satisfactory, showing, if anything, a better line between Honolulu and San Francisco than that from San Diego.

THE science of medicine and surgery according to European notions is making some progress in Japan. We learn that in the hospital at Hakodadi there are twenty young men regularly entered as students of medicine, daily lectures are given, and "bedside and other clinical demonstrations," the curriculum being similar to that of most medical schools. An illustrated medical journal in the Japanese language is also published every two months.

FROM the Superintendent's Report (1874) it appears that the Royal Botanic Gardens, Calcutta, are recovering very slowly from the devastating effects of the cyclones of 1864 and 1867. The growth of the shrubs and trees planted to replace those uprooted has not been very luxuriant, and a long time must elapse before the welcome and useful shade of noble trees such as once filled the garden will be enjoyed there again.

THE additions to the Zoological Society's Gardens during the past week include four Summer Ducks (*Aix sponsa*) from N. America, presented by Lord Braybrook, F.Z.S. ; a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mrs. Pole Shawe ; a Zebu (*Bos indicus*) born in the Menagerie ; a White-fronted Capuchin Monkey (*Cebus albifrons*) from S. America, deposited ; two Indian Tree Ducks (*Dendrocygna arcuata*) from India, received in exchange ; fourteen Basse (*Labrax lupus*), three Grey Mullet (*Mugil capito*), and a Cottus, (*Cottus bubalis*) from British Seas, purchased.

SCIENTIFIC SERIALS

Der Zoologische Garten.—In the December number the first article is one on monstrosities in wild birds, by Herr Pfarrer Jäckel, who describes several instances of additional and deficient limbs, and figures the leg of a Golden Eagle with two well-developed extra toes attached to the back of the tarsus.—The editor, Dr. Noll, treats of the salmon-fishery on the Rhine at St. Goar. In 1873 the number of fish captured was 1,162, weighing in all 16,612 lbs.—An account by Dr. Taiber of the chase of the South American Ostrich (*Rea americana*) with the *bolas* is reproduced from the "La Plata Monatsschrift."—Dr. R. Meyer describes two breeding nests of the squirrel (*Sciurus vulgaris*), in which the entrance was covered by a lid or flap, formed of fine grass ; he confirms the statement that these animals have other nests to which they remove their young in case of danger.—Dr. A. Praetorius writes on the domestic animals of the ancient Greeks.—Victor Ritter von Tschusi-Schmidhofen states, on the authority of L. v. Hueber, that the Lesser Kestrel (*Tinnunculus cenchris*) is spreading northward in Carinthia, and replacing the common species (*T. alaudarius*), and also gives an instance of the breeding of the Waxwing (*Bombicylla garrula*) in Austria, a nest having been found in May 1872, in the Castle park at Kremsier by Pfarrer Kaspar. Unfortunately, it was destroyed, and the birds disappeared.

Journal of the Asiatic Society of Bengal, Part II. No. 2, 1874.—Record of the Khairpur meteorite of Sept. 23, 1873, by H. B. Medlicott. This is simply a record of the appearance and fall of a meteorite, from the observations of several persons, and the weights of the specimens collected, the largest of which weighed 10 lb. 12 oz. 126 gr. The stone is described as being of the usual steel-grey colour and crypto-crystalline texture.—Contributions towards a knowledge of the Burmese Flora, Part I., by S. Kurz : an abridged enumeration of Burmese plants, phanerogamic and cryptogamic, as far as they have come to the writer's knowledge, containing the polypetalous dicotyledons, Ranunculaceæ to the end of the Geraniaceæ. Epitomised generic descriptions are given, as well as a conspectus of the species of each genus.—On the Asiatic species of Molossi, by G. E. Dobson. Two new species are described, viz., *Nyctinomus tragatus* and *N. Johorensis*.—Index to Part II. vol. xlii., 1873.

Astronomische Nachrichten, No. 2,018.—This number contains a long article detailing observations of the spectra of Winnecke's and Coggia's comets, and of changes in the head of that of Coggia. As to the spectrum of Winnecke's comet, the author states that on the 7th and 10th of May last the spectrum consisted of three bright bands, the middle one the brightest, and sharply limited towards the red end of the spectrum. The brightest portion of this band appeared a little more refrangible than the b_4 line, while the beginning of the band coincided with it. The bright central portion of the comet, 1½′ diameter, appeared to have in it certain bright points like stars of 12 to 14 magnitude, and the central portion gave a faint continuous spectrum. On the 6th of May, Coggia's comet gave a spectrum of three bands : the central one near b line was brightest, and the one nearest the blue the faintest ; the nucleus and contiguous portions gave a continuous spectrum, in addition to the former one, extending from wave-length 590 to 440. On the 18th the middle line was seen sharply limited towards the red and shading towards the blue ; the wave-length of the sharp limit was estimated at 515 ; the other bands were not so sharply defined on the red side as the central one, and the relative brightness of each is given as yellow, 2 ; green, 4 ; and blue, 1. The bands were strongest where crossed by the continuous spectrum of the nucleus. No other bands were visible ; the positions of the commencement of the bands from a mean of observations are, 1st band, 562·5 ; 2nd band, 515·1 ; and 3rd band, 471·6. A change in the comparative brightness of the bands appears to have been noticed at times, and the author observes that one might expect absorption bands in the continuous spectrum corresponding to the bright bands, and that the changes of brightness of the lines should be viewed as an important matter in reference to this expectation. Traces of absorption bands appear to have been noticed, but their position not fixed. The following table of comparison of spectra of comets and hydrocarbons is given :—

		Comet. Coggia.	Comet. Henry.	Comet II. 1868.
First band of Spectrum.	Beginning	562·5	562·6	563·1
	Brightest part ...	553·8	559	—
	End	541	541	538
Second ditto.	Beginning	515·1	517·1	517·2
	Brightest part ...	511·8	516	—
	End	500	500	492
Third ditto.	Beginning	471.6	472·7	471·4
	Brightest part ...	468·9	466	—
	End	465	464	458

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	Benzine.	Blue part of gas flame.	Blue part of petroleum flame.
Beginning of 1st band...	563·2	562·9	—
End	—	537	—
Beginning of 2nd band..	516·4	516·1	515·5 bright line.
		512·5 broad bright line.	512·1 faint band.
End of 2nd band	—	501	—
Beginning of 3rd band...	474·2	473·8	473 very delicate line.
Brightest part	471·2	—	472·5 faint bands.
End	—	464	466·0
		436·8 middle of a band.	437·1 middle of broad faint band.
		430·9 broad line.	430·8 bright line.

From this table it appears that the beginning of the bands of each comet correspond, but that the brightest parts of these vary in position. For comparison with other comets the brightest parts of the bands are given :—

	Comet I., 1871.	Tuttle's Comet.	Encke's Comet.	Coggia's Comet.
1st band	557	557	555	554
2nd band	511	513	512	512
3rd band	—	472	473	469

The remainder of the paper on the change of form consists of daily notes referring to drawings and giving measurements of the comet. The nucleus appears to have changed its shape from round to oval and other forms.—In No. 2,019 Dr. Luther gives an ephemeris for Planet (104) Clymene, which has not been seen since 1868.—Dr. Holetschek and Dr. Luther give position observations of comets and minor planets made last year.—G. W. Hill sends a note on a long period of irregularity of Hestia, arising from the action of the earth, and its application to ascertain the value of the solar parallax.—J. Palisa writes to say that he has discovered Clymene; he also saw Dione and Althæa again.—Winnecke mentions the discovery, by Borrelly, of a comet, position December 10th : Decl., + 39° 49′·5 ; R.A., 16h. 4m. 65s.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, Jan. 28.—"On the Theory of Ventilation : an attempt to establish a positive basis for the calculation of the amount of fresh air required for an inhabited air-space," by Surgeon-Major F. de. Chaumont, M.D., Assistant Professor of Hygiene, Army Medical School. Communicated by Prof. Parkes, M.D., F.R.S.

In a paper in the *Edinburgh Medical Journal* for May 1867, the author adduced some results to show that the evidence of the senses might be employed (if used with proper care and precautions) as the ground-work of a scale, and gave a short table of the amounts of respiratory impurity (estimated at CO_2) which corresponded to certain conditions noted as affecting the sense of smell.

It is generally admitted that it is organic matter that is the poison in air rendered impure by the products of respiration. It is also admitted that it is the same substance that gives the disagreeable sensation described as "closeness" in an ill-ventilated air-space. Although the nature of the organic matter may vary to a certain extent, it will be allowed that a condition of good ventilation may be established if we dilute the air sufficiently with fresh air, so that the amount of organic matter shall not vary *sensibly* from that of the external air. Observations, however, as far as they have gone, seem to show that the amount of organic impurity bears a fairly regular proportion to the amount of carbonic acid evolved by the inhabitant in an air-space ; and as the latter can be easily and certainly determined, we may take it as a *measure* of the condition of the air-space. If we adopt as our *standard* the point at which there is no sensible difference between the air of an inhabited space and the external air, and agree that this shall be determined by the effects on the sense of *smell*, our next step is to *ascertain* from experiment what is the average amount of CO_2 in such an air-space, from which we can then calculate the amount of air required to keep it in that condition. All the author's results have been obtained in barracks and hospitals.

The plan followed in all was to take the observations chiefly at night, when the rooms or wards were occupied, and when fires and lights (except the lamp or candle used for the observation) were out. On first entering the room from the outer air the sensation was noted and recorded just as it occurred to the observer, such terms as "fresh," "fair," "not close," "close," "very close," "extremely close," &c. being employed. The air was then collected (generally in two jars or bottles, for controlling experiments), and set aside with lime-water for subsequent analysis, and the temperatures of the wet and dry bulb thermometers noted. About the same time samples of the external air were also taken, and the thermometers read. In this way any unintentional bias in the record of sensations was avoided, and this source of fallacy fairly well eliminated.

Although the records of sensation are various in terms, the author has thought that they might be advantageously reduced to *five* orders or classes, each of which he characterises by one or more appropriate terms in common use.

He then proceeds to give an analysis of the results of his observations on the case of each order, from which he draws the following conclusions :—

In order No. 1, "Fresh," &c., a condition of atmosphere not *sensibly* different from the external air, the conditions which are those of *good* ventilation are the following :—

Temperature about 63° Fahrenheit.

Vapour shall not exceed 4·7 grains per cubic foot.

Carbonic acid shall not exceed the amount in the outer air by more than 0·2000 per 1000 volumes.

No. 2.—"Rather close," &c. A condition of atmosphere in which the organic matter begins to be appreciated by the senses, and the ventilation ceases to be *good* :—

Vapour in the air exceeds 4·7 grains per cubic foot.

CO_2 in excess over outer air, ratio reaching 0·4000 per 1000 volumes.

No. 3.—"Close," &c. The point at which the organic matter begins to be decidedly disagreeable to the senses, and the ventilation begins to be decidedly *bad* :—

Vapour reaches 4·9 grains per cubic foot.

Carbonic acid in excess over outer air to the amount of 0·6000 per 1000 volumes.

No. 4.—"Very close," &c. The point at which the organic matter begins to be offensive and oppressive to the senses, and the ventilation *very bad* :—

Vapour reaches 5·00 grains per cubic foot.

Carbonic acid in excess over outer air reaches 0·8000 per 1000 volumes.

No. 5.—"Extremely close," &c. The maximum point of differentiation by the senses :—

Vapour 5·100 grains per cubic foot.

Carbonic acid, in excess over the amount in the outer air beyond, 0·8500 per 1000 volumes.

It will at once be seen that the figures in No. 5 differ but little from those in No. 4, and that the probable *limit of differentiation* by the senses is reached in No. 4. The number of recorded observations in No. 5 is also very few comparatively ; and the author thinks it would therefore be better to group the two together thus :—

Nos. 4 and 5 combined, being the probable limit of possible differentiation by the senses.

1. *Temperature.*—In the outer air 51°·43, in the inhabited air-spaces 65°·12, or a mean difference of 13°·69.

2. *Vapour and Humidity.*—The vapour in the outer air was 3·729, inside 5·108, or a mean difference of 1·379 grain, corresponding to a lowering of relative humidity of 8·92 per cent.

3. *Carbonic Acid.*—In the outer air 0·3928, in the inhabited air-spaces 1·2461, or a mean difference due to respiratory impurity of 0·8533, the range for probable error of result being between 0·8717 and 0·8349.

We may therefore say that when the vapour * reaches 5·100 grains per cubic foot, and the CO_2 in excess 0·8000 volume per 1,000, the maximum point of differentiation by the senses is reached.

The author then shows that there is a regular progression as we pass from one order to another.

He then proceeds to give a large number of tabular statements, calculations, and ratios, his practical conclusion being that the experimental data already quoted fairly justify the adoption of the following

Conditions as the Standard of good Ventilation.

Temperature (dry bulb) 63° to 65° Fahrenheit.
,, (wet bulb) 58° to 61° ,,

* It is to be understood that the amounts of vapour stated in these cases are in reference to a mean temperature of about 63 F.

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